JP 11-329134A

(54) POWER SWITCHGEAR

(11)Publication number : **11-329134**
(43)Date of publication of application : **30.11.1999**

(51)Int.Cl. **H01H 9/30**
H01H 9/46
H01H 15/02
H01H 33/04
H01H 33/22
H01H 50/38
H01H 73/18

(21)Application number : **10-138825**
(22)Date of filing : **20.05.1998**

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(57)Abstract:
PROBLEM TO BE SOLVED: To prevent consumption of contacts and incapability of cutoff, in the current cutoff in all current areas.
SOLUTION: A fixed iron core 4 having an excitation coil 3 is set opposite to a movable iron core 5 through an unjointing spring 6. A cross bar 7 is mounted on the movable iron core 5 a window 8 of which holds a movable terminal 9 energized by a contacting spring 10. Movable contacts 13 are fitted to both ends of the movable terminal 9, and fixed contacts 14 are set opposite to the movable contacts 13. An actuator 19 at the top of the cross bar 7 has an operating curved surface 20 composed of plane parts 21 and concave parts 22. Plural metal grids 23 are arranged near the gaps between the contacts. The metal grids 23 are fixed to curved cams 24. In the closed state of the contacts, the metal grids 23 are positioned near the gaps between the contacts. When the voltage impressed on the excitation coil 3 is removed, the movable iron core 5 is moved upward to raise the actuator 19. Thereby, the ends of the cams 14 fall into the concave parts 22 of the operating curved surface 20, to swing the metal grids 23, thus they back away from the gaps between the contacts.

[Claim(s)]
[Claim 1]In a power switching device which has a circuit interrupter which carries out the extinction of arc of the arc produced between traveling contact concerned and a stationary contact when a cable run is opened and closed, a traveling contact and a stationary contact contact or open and a traveling contact and a stationary contact open, A power switching device, wherein said circuit interrupter keeps away from contact interspace spare time produced when said traveling contact is interlocked with operation which keeps away from said stationary contact and said traveling contact and a stationary contact open.
[Claim 2]In a power switching device which has a circuit interrupter which carries out the extinction of arc of the arc produced between traveling contact concerned and a stationary contact when a cable run is opened and closed, a traveling contact and a stationary contact contact or open and a traveling contact and a stationary contact open, A power switching device said circuit interrupter's approaching contact interspace spare time produced when said traveling contact is interlocked with operation which keeps away from said stationary contact and said traveling contact and a stationary contact open, and keeping away from the account point-of-contact interspace spare time of back to front.

[Claim 3]The power switching device according to claim 1 or 2 performing operation which a circuit interrupter keeps away or approaches to said contact interspace spare time according to a cam mechanism.
[Claim 4]Provide a driver of a cam mechanism in the traveling contact side, and connect said circuit interrupter with a follower, and said traveling contact is interlocked with operation which keeps away from said stationary contact, A power switching device of any one description of the Claims 1-3 characterized by making it a circuit interrupter keep away or approach to said contact interspace spare time.
[Claim 5]A power switching device of any one description of the Claims 1-4, wherein said circuit interrupter consists of a conductive material.
[Claim 6]A power switching device of any one description of the Claims 1-5, wherein said circuit interrupter consists of a conductive and magnetic material.
[Claim 7]A power switching device of any one description of the Claims 1-6 making said circuit interrupter into two or more metallic grids which consist of a conductive and magnetic material.
[Claim 8]A power switching device of any one description of the Claims 1-7, wherein said circuit interrupter consists of a PTC element linked to two or more commutation electrodes and the commutation inter-electrode concerned.
[Claim 9]A power switching device of any one description of the Claims 1-8 consisting of ****** which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned.
[Claim 10]A power switching device of any one description of the Claims 1-9 consisting of rectifiers which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned.
[Claim 11]A power switching device of any one description of the Claims 1-10 consisting of resistance elements and rectifiers which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned.

[Detailed Description of the Invention]
[0001]
[Field of the Invention]In the current cutoff in all the current regions, such as a trouble current field, a striking current field of a motor, and an amperage rating region of a motor, this invention relates to the power switching device which neither contact erosion contact wear nor interception impossible produces in more detail about a power switching device.
[0002]
[Description of the Prior Art]Drawing 11 is a sectional view showing an example of the conventional power switching device. drawing 12 shows the arc extinction of arc process in the power switching device shown in drawing 11 -- it is a sectional view in part. The housing 2 is attached to the mount 1. The exiting coil 3 is arranged in the housing 2. The exiting coil 3 is held in the fixed iron core 4. The moving core 5 has a predetermined interval, counters the fixed iron core 4 and arranges it. The tripping spring 6 is formed between the fixed iron core 4 and the moving core 5. The tripping spring 6 energizes the moving core 5 up. The crossbar 7 is attached to the upper part of the moving core 5. The window 8 is formed in the upper part of the crossbar 7. The movable contact 9 is held at the window 8. The movable contact 9 is caudad energized with the contacting spring 10 which consists of compression springs.
Along with the window 8, it is slidable.

[0003]The slide guide of the crossbar 7 is carried out to the sliding direction with the hole 11 and the wall 12 of the housing 2. The traveling contact 13 is attached to the both ends of the movable contact 9. The traveling contact 13 has a predetermined interval and the placed opposite is carried out to the stationary contact 14. The stationary contact 14 is attached on fixed contact 15. Connection fixation of fixed contact 15 is electrically carried out to the tag block 16. The terminal

screw 17 for connecting with an external circuit is screwed in the tag block 16. The arc runner 18 is attached to fixed contact 15. Above the arc runner 18, two or more metallic grids 801 for extinction of arcs are arranged. The metallic grids 801 are being fixed to the arc box 802.

[0004]Below, operation of this power switching device 800 is explained. If voltage is impressed to the exiting coil 3, magnetic flux will occur. For this reason, a suction force arises between the fixed iron core 3 and the moving core 5. If this suction force trips and energization force with the spring 6 is exceeded, the moving core 5 and the crossbar 7 will move caudad. Since the moving core 5 is attached to the crossbar 7, the traveling contact 13 and the stationary contact 14 contact by movement of the crossbar 7. Since the interval of the moving core 5 and the fixed iron core 4 is larger than the interval of the traveling contact 13 and the stationary contact 14, the crossbar 7 moves further caudad, after the traveling contact 13 and the stationary contact 14 have contacted. For this reason, contact wipe is obtained and the contacting spring 10 compresses. The energization force to the movable contact 9 by this contacting spring 10 turns into contact pressure of the traveling contact 13 and the stationary contact 14. Closing movement is completed above.

[0005]Next, if the voltage of the exiting coil 3 is removed, the suction force between the moving core 5 and the fixed iron core 4 will be extinguished. For this reason, according to the energization force of the tripping spring 6, the moving core 5 and the crossbar 7 move to the method of figure Nakagami, and the traveling contact 13 and the stationary contact 14 open them.

[0006]Opening of the traveling contact 13 and the stationary contact 14 will generate the arc A among both 13 or 14 **. The arc A moves in the direction which swells in response to the power to the outside according to the repulsive force committed between the arcs A generated in an opposite hand, and the electromagnetic force committed between the current which flows into fixed contact 15. For this reason, the arc spot by the side of the stationary contact 14 is commutated to the arc runner 18, and the arc A moves outside further. And it enters into the metallic grids 801 and is elongated, and the arc A is divided by two or more metallic grids 801, and the extinction of arc of it is carried out by cooling within the metallic grids 801 concerned.

[0007]
[Problem to be solved by the invention]However, in the above-mentioned conventional power switching device 800, the arc A does not reach to the metallic grids 801 in interception of the current in a small current field. For this reason, since the arc A remained on the point of contact for a long time at the time of current cutoff, the burden was placed on the points of contact 13 and 14, and there was a problem that consumption became large. On the other hand, in high current fields, such as at the time of a short circuit accident, etc., if the metallic grids 801 are arranged in a small current field in the position in which an arc extinction of arc is possible, since the energy of breaking current is large, an arc will remain adhering on the metallic grids 801 which approached. For this reason, the arc was not extended, and ****(ed) and there was a problem that intercepting became impossible.

[0008]Interception of a locked rotor current (about 6 time current of amperage rating) required for them when carrying out interception of the usual amperage rating and the inching action of a motor to power switching devices, such as magnetic contact used for opening and closing of a motor, and interception (about 10 or more times of amperage rating) of trouble current are required. However, in the conventional power switching device 800, since there are the above problems, according to the biggest current value, the position of the metallic grids 801 has usually been set up not produce interception impossible. However, in order for contact erosion contact wear to occur in a small current field and to cope with this contact erosion contact wear, the new

problem that volume of the points of contact 13 and 14 concerned must be enlarged arises.
[0009]this invention should do this invention in view of the above -- it comes out. In the current cutoff in all the current regions, such as **, a trouble current field, a striking current field of a motor, and an amperage rating region of a motor, the purpose is electric power ****** which neither contact erosion contact wear nor interception impossible produces.

[0010]
[Means for solving problem]In order to attain the above-mentioned purpose, the power switching device by this invention, In the power switching device which has a circuit interrupter which carries out the extinction of arc of the arc produced between the traveling contact concerned and stationary contact when a cable run is opened and closed, a traveling contact and a stationary contact contact or open and a traveling contact and a stationary contact open, Said circuit interrupter keeps away from the contact interspace spare time produced when said traveling contact is interlocked with the operation which keeps away from said stationary contact and said traveling contact and a stationary contact open.

[0011]Since a circuit interrupter is near the contact interspace spare time when a point of contact opens, also in a small current field, the commutation of an arc is possible. When a circuit interrupter keeps away from contact interspace spare time, conglutination of the arc in a high current field is prevented, and the extinction of arc of the arc concerned is made possible. For this reason, consumption of a point of contact can be prevented and current can be intercepted in a large field.

[0012]The power switching device by the next invention opens and closes a cable run, when a traveling contact and a stationary contact contact or open, In the power switching device which has a circuit interrupter which carries out the extinction of arc of the arc produced between the traveling contact concerned and stationary contact when a traveling contact and a stationary contact open, Said circuit interrupter approaches the contact interspace spare time produced when said traveling contact is interlocked with the operation which keeps away from said stationary contact and said traveling contact and a stationary contact open, and it keeps away from the account point-of-contact interspace spare time of back to front.

[0013]By bringing a circuit interrupter close to contact interspace spare time in early stages of opening of a point of contact, the cutoff performance in an amperage rating field improves. For this reason, consumption of a point of contact decreases and a contact life can be lengthened. Since a small point of contact can be used, equipment can be miniaturized.

[0014]The power switching device by the next invention is made to perform operation which a circuit interrupter keeps away or approaches to said contact interspace spare time according to a cam mechanism in the above-mentioned power switching device.

[0015]One side of the driver of a cam mechanism and the follower was connected with the circuit interrupter, and another side was connected the contact interspace spare time side (a traveling contact and/or a stationary contact), and a circuit interrupter is kept away to said contact interspace spare time by cam operation, or it was made to bring close. If it has such easy composition, failure of equipment can be lessened and equipment can be operated certainly.

[0016]In the above-mentioned power switching device, the power switching device by the next invention provides the driver of a cam mechanism in the traveling contact side, and it connects said circuit interrupter with a follower, and said traveling contact is interlocked with the operation which keeps away from said stationary contact, It is made for a circuit interrupter to keep away or

approach to said contact interspace spare time.

[0017]Since a traveling contact moves, a driver is provided in the traveling contact side concerned, the follower which follows to this driver is connected with a circuit interrupter, and it was made to make the circuit interrupter concerned exercise. According to the starting composition, equipment can be constituted easily. Since it is easy composition, failure of equipment can be lessened and equipment can be operated certainly.

[0018]As for the power switching device by the next invention, said circuit interrupter consists of a conductive material in the above-mentioned power switching device.

[0019]By constituting a circuit interrupter from a conductive material, an arc can be promptly commutated to a circuit interrupter. Collectively, after commutation can improve the arc extinguishing performance of equipment by keeping away a circuit interrupter from contact interspace spare time.

[0020]The power switching device by the next invention consists of material of conductivity [circuit interrupter / said] and magnetism in the above-mentioned power switching device.

[0021]Since an arc suction effect will be acquired when the generating magnetic flux by an arc current passes in a magnetic material if it does in this way, the commutation to a circuit interrupter happens easily. An arc can be promptly commutated to a circuit interrupter by constituting a circuit interrupter from a conductive material. For this reason, the arc extinguishing performance of equipment can be raised.

[0022]The power switching device by the next invention makes said circuit interrupter two or more metallic grids which consist of a conductive and magnetic material in the above-mentioned power switching device.

[0023]By providing two or more metallic grids, by metallic grids, division and since a partial pressure is carried out, an arc can raise arc extinguishing performance.

[0024]The power switching device by the next invention consists of a PTC element which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned in the above-mentioned power switching device.

[0025]A PTC element has the characteristic which resistance increases rapidly, when constant temperature is exceeded. An increase of resistance will carry out the ** style of the arc current rapidly. For this reason, when PTC is low temperature, it becomes easy to commutate, and on the other hand, when PTC is an elevated temperature, the ** style of the arc current is carried out. A circuit interrupter keeps away and after commutation extends an arc. According to these synergistic effects, the current cutoff in a large current region becomes possible.

[0026]The power switching device by the next invention consists of a resistance element which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned in the above-mentioned power switching device.

[0027]Generally the system which is made to commutate an arc to a resistance element and carries out a ** style to it is known. If the resistance of a resistance element is made high in order to enlarge a ** style effect, commutation will become difficult to happen here. Then, it will become easy to commutate if a circuit interrupter is located near the contact interspace spare time.

What is necessary is just to keep away a circuit interrupter from contact interspace spare time, after commutating. If it does in this way, the cutoff performance of an arc will improve.

[0028]The power switching device by the next invention consists of a rectifier which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned in the above-mentioned power switching device.

[0029]Generally, when making it commutate to a rectifier, commutation happens at the time of for Masakata, and current is prevented at the time of an opposite direction, but reignition happens at the time of for [of the following] Masakata. However, in this composition, since a circuit interrupter keeps away from contact interspace spare time, reignition does not happen. For this reason, the arc extinguishing performance of equipment can be improved.

[0030]The power switching device by the next invention consists of resistance element **** and the rectifier which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned in the above-mentioned power switching device.

[0031]Thus, by using a resistance element and a rectifier together, a synergistic effect is acquired and the arc extinguishing performance of equipment can be improved more.

[0032]
Mode for carrying out the invention]It explains in detail, referring to Drawings per [concerning this invention] power switching device hereafter. This invention is not limited by this embodiment.

[0033]Embodiment 1. drawing 1 is a sectional view showing the power switching device concerning this embodiment of the invention 1. The housing 2 is attached to the mount 1. The exiting coil 3 is arranged in the housing 2. The exiting coil 3 is held in the fixed iron core 4. The moving core 5 has a predetermined interval, counters the fixed iron core 4 and arranges it. The tripping spring 6 is formed between the fixed iron core 4 and the moving core 5. The tripping spring 6 energizes the moving core 5 up. The crossbar 7 is attached to the upper part of the moving core 5. The crossbar 7 is constituted by the insulating material. The window 8 is formed in the upper part of the crossbar 7. The movable contact 9 is held at the window 8. The movable contact 9 is caudad energized with the contacting spring 10 which consists of compression springs, and is slidable along with the window 8.

[0034]The slide guide of the crossbar 7 is carried out to the sliding direction with the hole 11 and the wall 12 of the housing 2. The traveling contact 13 is attached to the both ends of the movable contact 9. The traveling contact 13 has a predetermined interval and the placed opposite is carried out to the stationary contact 14. The stationary contact 14 is attached on fixed contact 15. Connection fixation of fixed contact 15 is electrically carried out to the tag block 16. The terminal screw 17 for connecting with an external circuit is screwed in the tag block 16. The arc runner 18 is attached to fixed contact 15.

[0035]The actuator 19 is attached to the upper bed of the crossbar 7. The side of the actuator 19 is the operating curved surface 20. The operating curved surface 20 comprises the flat-surface part 21 and the crevice 22. Near the void between the traveling contact 13 and the stationary contact 14, two or more metallic grids 23 for extinction of arcs are arranged. The metallic grids 23 consist of a conductive and magnetic material. The metallic grids 23 are being fixed to the cam 24 of a cloud type. Rotation support of the cam 24 is carried out by the shank 25. The shank 25 penetrates the center of the twist spring 26. One end of the twist spring 26 stopped for the cam 24,

and the other end has stopped to the arc box 27. With the twist spring 26, the end 24a of the cam 24 is energized to the operating curved surface 20 of the actuator 19.

[0036]Below, operation of this power switching device 100 is explained. About the operation which voltage is impressed to the exiting coil 3 and the points of contact 13 and 14 close, since it is the same as that of the above-mentioned conventional case, explanation is omitted. Drawing 2 is a fragmentary sectional view of the power switching device 100 shown in drawing 1, and shows the closed state of the points of contact 13 and 14. Where the points of contact 13 and 14 are closed, the end 24a of the cam 24 is in contact with the flat-surface part 20 of the actuator 19. For this reason, the metallic grids 23 are located near the contact interspace spare time.

[0037]If the voltage impressed to the exiting coil 3 is removed next, the moving core 5 will trip and it will move up by operation of the spring 6. Since the actuator 19 is connected with the moving core 5 via the crossbar 7, the actuator 19 goes up with the moving core 5. Since the cam 24 is energized by the twist spring 26 with the rise of the actuator 19, the end 24a of the cam 24 falls in the crevice 22 of the operating curved surface 20. The metallic grids 23 rock by this and it keeps away from contact interspace spare time (refer to drawing 1). As a result, when the traveling contact 13 and the stationary contact 14 begin to open, the metallic grids 23 are located near the contact interspace spare time, but when the traveling contact 13 and the stationary contact 14 separate to some extent after that, the metallic grids 23 come to keep away from contact interspace spare time.

[0038]First, the arc A produced between the points of contact 13 and 14 is in the state which the traveling contact 13 and the stationary contact 14 began to open, and is commutated to the metallic grids 23 near the contact interspace spare time. Since the metallic grids 23 are made of a conductive and magnetic material, they draw the arc A in the metallic grids 23 concerned because the magnetic flux generated according to an arc current passes along the inside of the metallic grids 23, and increase the commutation effect. Next, according to a rise of the crossbar 7, the end 24a of the cam 24 falls in the crevice 22 of the operating curved surface 20, and the metallic grids 23 begin to keep away from contact interspace spare time. The commutated arc A is extended by this to the position (refer to drawing 1) which is separated from a point of contact, arc voltage increases, and the arc A carries out an extinction of arc.

[0039]If constituted as mentioned above, the arc A in an amperage rating field can be intercepted in locating the metallic grids 23 in a contact nearness side, and the arc A in a trouble current field can be intercepted by keeping away the metallic grids 23 from contact interspace spare time behind Kaisei of the points of contact 13 and 14. That is, the circuit interrupter which acts effectively in all the current regions can be obtained. Since the cutoff performance in an amperage rating region is improved, contact erosion contact wear decreases and reinforcement can be attained. Since a point of contact can be miniaturized, it becomes inexpensive.

[0040]Embodiment 2. drawing 3 is a sectional view showing the power switching device concerning this embodiment of the invention 2. Although it is composition [like] with the power switching device 200 substantially the same as the power switching device 100 concerning Embodiment 1 concerning this Embodiment 2, the form of the operating curved surface 20 of the actuator 19 differs. Hereafter, this different point is explained and explanation is omitted about other composition. The operating curved surface 20 of the actuator 19 comprises the 1st crevice 201, the flat-surface part 202, and the 2nd crevice 203 from the upper part. The end 24a of the cam 24 has fallen in the 1st crevice 201 in the state of Kaisei of the points of contact 13 and 14.

[0041]Drawing 4 and drawing 5 are the section explanatory views showing the operating state of the power switching device 200 shown in drawing 3. About the operation which voltage is impressed to the exiting coil 3 and the points of contact 13 and 14 close, since it is the same as that of the above-mentioned conventional case, explanation is omitted. Where the points of contact 13 and 14 are closed, the end 24a of the cam 24 has fallen in the 1st crevice 201 of the actuator 19. For this reason, the metallic grids 23 are in the position which is separated from contact interspace spare time.

[0042]If the voltage impressed to the exiting coil 3 is removed next, the moving core 9 will trip and it will move up by operation of the spring 8. Since the actuator 19 is connected with the moving core 9 via the crossbar 7, the actuator 19 goes up with the moving core 9. Since the 1st crevice 201 has a certain amount of stroke, in early stages of opening with the traveling contact 13 and the stationary contact 14, the metallic grids 23 are in the position which is separated from contact interspace spare time (refer to drawing 3). Then, the end 24a of the cam 24 is made the flat-surface part 202 of the operating curved surface 20 with a rise of the actuator 19. The metallic grids 23 rock by this and contact interspace spare time is approached (refer to drawing 4).

[0043]Next, the end 24a of the cam 24 falls in the 2nd crevice 203 of the operating curved surface 20 because the actuator 19 goes up further. From this, the metallic grids 23 keep away from contact interspace spare time (refer to drawing 5). As a result, when the traveling contact 13 and the stationary contact 14 begin to open, the metallic grids 23 are separated from contact interspace spare time, but when it approaches after that and the traveling contact 13 and the stationary contact 14 separate to some extent, the metallic grids 23 come to keep away from contact interspace spare time again.

[0044]In the opening process of the traveling contact 13 and the stationary contact 14, since the metallic grids 23 approach contact interspace spare time, also in an amperage rating field, the arc A generated between the points of contact 13 and 14 can commutate the arc A. The extinction of arc of the arc A concerned can be carried out after arc commutation by keeping away the metallic grids 23 from contact interspace spare time, and extending the arc A. By keeping away the metallic grids 23 from contact interspace spare time, even if it is a trouble current field, the arc A can be intercepted. That is, the circuit interrupter which acts effectively in all the current regions can be obtained. Since the cutoff performance in an amperage rating region is improved, contact erosion contact wear decreases and reinforcement can be attained. Since a point of contact can be miniaturized, it becomes inexpensive.

[0045]embodiment 3. drawing 6 shows the power switching device concerning this embodiment of the invention 3 -- it is a sectional view in part. the power switching device 300 concerning this Embodiment 3 is substantially the same as the power switching device 200 concerning Embodiment 2 -- although like, circuit interrupter portions differ. Hereafter, this different point is explained and explanation is omitted about other composition. The top current electrode 301 and the lower commutation electrode 302 are formed in the cam 24. Besides between the part commutation electrode 301 and the lower commutation electrode 302, PTC element 303 is connected. PTC element 303 is laid under the cam 24 inside. The commutation electrodes 301 and 302 consist of a conductive and magnetic material.

[0046]Below, operation of this power switching device 300 is explained. If the traveling contact 13 and the stationary contact 14 open based on an operation of an exiting coil, an arc will occur between the points of contact 13 and 14. This arc is commutated to the commutation electrodes 301 and 302 located near the contact interspace spare time. The arc current commutated to the commutation electrodes 301 and 302 flows into PTC element 303. PTC element 303 has the

characteristic which the resistance increases rapidly, when a certain constant temperature is exceeded. Since the temperature of PTC element 303 is low, it is easy to commutate an arc the early stages of arc commutation. Then, when an arc current flows into PTC element 303, the temperature of PTC element 303 goes up and resistance rises rapidly. Thereby, the ** style of the arc current is carried out rapidly. An arc is quickly extended because the commutation electrodes 301 and 302 separate from contact interspace spare time with rocking of the cam 24. According to this synergistic effect, an arc carries out an extinction of arc effectively. As a result, the cutoff performance of an arc improves in a large current region.

[0047]embodiment 4. drawing 7 shows the power switching device concerning this embodiment of the invention 4 -- it is a sectional view in part. the power switching device 400 concerning this Embodiment 4 is substantially the same as the power switching device 200 concerning Embodiment 2 -- although like, circuit interrupter portions differ. Hereafter, this different point is explained and explanation is omitted about other composition. The top current electrode 301 and the lower commutation electrode 302 are formed in the cam 24. Besides between the part commutation electrode 301 and the lower commutation electrode 302, the resistance element 401 is connected. The resistance element 401 is laid under the cam 24 inside. The commutation electrodes 301 and 302 consist of a conductive and magnetic material.

[0048]Below, operation of this power switching device 400 is explained. If the traveling contact 13 and the stationary contact 14 open based on an operation of an exiting coil, an arc will occur between the points of contact 13 and 14. This arc is commutated to the commutation electrodes 301 and 302 located near the contact interspace spare time. The arc current commutated to the commutation electrodes 301 and 302 flows into the resistance element 401, and a ** style is carried out rapidly.

[0049]By the way, although it is necessary to make the resistance of the resistance element 401 high for enlarging a ** style effect, it becomes difficult to commutate an arc conversely. So, in this power switching device 400, the commutation electrodes 301 and 302 are carrying out that it is easy to make an arc commutate by approaching contact interspace spare time with rocking of the cam 24, and separating. After arc commutation, since the commutation electrodes 301 and 302 keep away from contact interspace spare time, an arc is extended quickly. In this power switching device 400, an arc carries out an extinction of arc effectively according to the above-mentioned synergistic effect. As a result, the cutoff performance of an arc improves in a large current region.

[0050]embodiment 5. drawing 8 shows the power switching device concerning this embodiment of the invention 5 -- it is a sectional view in part. the power switching device 500 concerning this Embodiment 5 is substantially the same as the power switching device 200 concerning Embodiment 2 -- although like, circuit interrupter portions differ. Hereafter, this different point is explained and explanation is omitted about other composition. The top current electrode 301 and the lower commutation electrode 302 are formed in the cam. Besides between the part commutation electrode 301 and the lower commutation electrode 302, the rectifier 501 is connected. The rectifier 501 is laid under the cam 24 inside. The commutation electrodes 301 and 302 consist of a conductive and magnetic material.

[0051]Below, operation of this power switching device 500 is explained. If the traveling contact 13 and the stationary contact 14 open based on an operation of an exiting coil, an arc will occur between the points of contact 13 and 14. This arc is commutated to the commutation electrodes 301 and 302 located near the contact interspace spare time. Since it is connected to the rectifier 501, an arc current flows for Masakata and the commutation electrodes 301 and 302 do not flow

into an opposite direction. Here, even if the current inhibition phenomenon of an opposite direction happens, reignition arises at the time of for [of the following] Masakata. However, in this power switching device 500, since the commutation electrodes 301 and 302 keep away from an inter-electrode void after the movable electrode 13 and the fixed electrode 14 open, it is hard to produce reignition. As mentioned above, an arc carries out an extinction of arc effectively according to the synergistic effect of keeping away the commutation electrodes 301 and 302 and extending an arc quickly. As a result, the performance of the extinction of arc by the rectifier 501 can fully be pulled out, and the cutoff performance of an arc improves in a large current region.

[0052]embodiment 6. drawing 9 shows the power switching device concerning this embodiment of the invention 6 -- it is a sectional view in part. the power switching device 600 concerning this Embodiment 6 is substantially the same as the power switching device 200 concerning Embodiment 2 -- although like, circuit interrupter portions differ. Hereafter, this different point is explained and explanation is omitted about other composition. The top current electrode 301 and the lower commutation electrode 302 are formed in the cam. Besides between the part commutation electrode 301 and the lower commutation electrode 302, the resistance element 401 and the rectifier 501 are connected in series. The resistance element 401 and the rectifier 501 are laid under the cam 24 inside. The commutation electrodes 301 and 302 consist of a conductive and magnetic material.

[0053]Below, operation of this power switching device 600 is explained. If the traveling contact 13 and the stationary contact 14 open based on an operation of an exiting coil, an arc will occur between the points of contact 13 and 14. This arc is commutated to the commutation electrodes 301 and 302 located near the contact interspace spare time. Since it is connected to the resistance element 401 and the rectifier 501, the commutation elements 301 and 302 flow through an arc current into the resistance element 401 and the rectifier 501. A ** style effect is acquired by this resistance element 401, and the reverse current inhibition effect is acquired with the rectifier 501. Since the commutation electrodes 301 and 302 keep away from an inter-electrode void after the movable electrode 13 and the fixed electrode 14 open, it is hard to produce reignition. As mentioned above, an arc carries out an extinction of arc effectively according to the synergistic effect of carrying out a ** style by the resistance element 401, preventing the reverse current by the rectifier 501, and keeping away the commutation electrodes 301 and 302 and extending an arc quickly. As a result, the cutoff performance of an arc improves in a large current region.

[0054]embodiment 7. drawing 10 shows the power switching device concerning this embodiment of the invention 7 -- it is a sectional view in part. the power switching device 700 concerning this Embodiment 7 is substantially the same as the power switching device 100 concerning Embodiment 1 -- although like, circuit interrupter portions differ. Hereafter, this different point is explained and explanation is omitted about other composition. The supporter 702 supporting two or more metallic grids 701 is being fixed to the upper bed of the crossbar 7. The supporter 702 is accommodated in the arc box 703. The metallic grids 701 are countered and formed in the arc runner 18. The metallic grids 701 consist of a conductive and magnetic material.

[0055]Below, operation of this power switching device 700 is explained. About the operation which voltage is impressed to an exiting coil and the points of contact 13 and 14 close, since it is the same as that of the above-mentioned conventional case, explanation is omitted. Where voltage is impressed to an exiting coil, since the traveling contact 13 and the stationary contact 14 are closed, the metallic grids 701 are located in 13 or about 14 point of contact. If voltage is removed, the moving core 5 will trip and it will move up by operation of the spring 6. Since the supporter 702 is connected with the moving core 5 via the crossbar 7, the supporter 702 goes up with the

moving core 5. The metallic grids 701 go up with a rise of this supporter 702.

[0056]In early stages of contact Kaisei, although the metallic grids 701 are near the contact interspace spare time, it keeps away gradually and goes. For this reason, in early stages of Kaisei, it is easy to commutate the arc produced between the points of contact 13 and 14 to the metallic grids 701. Since the metallic grids 701 keep away from contact interspace spare time, an arc is extended and carries out the cooling extinction of arc of after commutation.

[0057]According to this power switching device 700, a circuit interrupter can be constituted easily. For this reason, the wear etc. which are produced by a mechanism part decrease and endurance improves. Above, although the metallic grids 701 are used as a circuit interrupter, PTC element 303 like the aspects 3-6 of the above-mentioned implementation, the resistance element 401, the rectifier 501, etc. may be used combining the commutation electrodes 301 and 302.
[0058]
[Effect of the Invention]According to the power switching device concerning this invention, a traveling contact is interlocked with the operation which keeps away from said stationary contact as explained above, Since it was made for said circuit interrupter to keep away from the contact interspace spare time produced when said traveling contact and a stationary contact open, conglutination of an arc [in / also in a small current field, the commutation of an arc is possible, and / a high current field] can be prevented. For this reason, consumption of a point of contact can be prevented and current can be intercepted in a large field.

[0059]In the power switching device concerning the next invention, a traveling contact is interlocked with the operation which keeps away from said stationary contact, Since said circuit interrupter approaches the contact interspace spare time produced when said traveling contact and a stationary contact open and it was made to keep away from the account point-of-contact interspace spare time of back to front, the cutoff performance in an amperage rating field improves, consumption of a point of contact decreases and a contact life can be lengthened. Since a small point of contact can be used, equipment can be miniaturized.

[0060]In the power switching device concerning the next invention, since the cam mechanism was made to perform operation which a circuit interrupter keeps away or approaches to contact interspace spare time, equipment can be constituted easily and failure of equipment can be lessened. Equipment can be operated certainly.

[0061]The driver of a cam mechanism is provided in the traveling contact side, and said circuit interrupter is connected with a follower, said traveling contact is interlocked with the operation which keeps away from said stationary contact, and it was made for a circuit interrupter to keep away or approach to said contact interspace spare time in the power switching device concerning the next invention. According to such composition, equipment can be constituted easily. Since it is easy composition, failure of equipment can be lessened and equipment can be operated certainly.

[0062]In the power switching device concerning the next invention, a conductive material's having constituted the circuit interrupter and an arc can be promptly commutated to a circuit interrupter, and the arc extinguishing performance of equipment can be improved.

[0063]In the power switching device concerning the next invention, since the circuit interrupter was constituted from a magnetic material, the commutation to a circuit interrupter happens easily. Since the circuit interrupter was constituted from a conductive material, an arc can be promptly commutated to a circuit interrupter. For this reason, the arc extinguishing performance of

equipment can be raised.

[0064]In the power switching device concerning the next invention, since two or more metallic grids were provided, by metallic grids, it divides and an arc carries out a partial pressure. For this reason, arc extinguishing performance can be raised.

[0065]In the power switching device concerning the next invention, since it constituted from a PTC element which connected the circuit interrupter to two or more commutation electrodes and the commutation inter-electrode concerned, the current cutoff in a large current region becomes possible according to the synergistic effect of a circuit interrupter keeping away and extending an arc after commutation.

[0066]In the power switching device concerning the next invention, since it constituted from a resistance element which connected the circuit interrupter to two or more commutation electrodes and the commutation inter-electrode concerned, A circuit interrupter can be located near the contact interspace spare time, and the cutoff performance of an arc can be raised after commutation according to the synergistic effect of keeping away a circuit interrupter from contact interspace spare time.

[0067]The power switching device concerning the next invention constituted the circuit interrupter from the rectifier linked to two or more commutation electrodes and the commutation inter-electrode concerned. In the starting composition, since a circuit interrupter keeps away from contact interspace spare time, reignition does not happen. For this reason, the arc extinguishing performance of equipment can be improved.

[0068]In the power switching device concerning the next invention, since the circuit interrupter was constituted from resistance element **** and the rectifier linked to two or more commutation electrodes and the commutation inter-electrode concerned, these synergistic effects are acquired and the arc extinguishing performance of equipment can be improved more.

[Brief Description of the Drawings]
[Drawing 1]It is a sectional view showing the power switching device concerning this embodiment of the invention 1.
[Drawing 2]It is a fragmentary sectional view of the power switching device shown in drawing 1, and the closed state of a point of contact is shown.
[Drawing 3]It is a sectional view showing the power switching device concerning this embodiment of the invention 2.
[Drawing 4]It is a section explanatory view showing the operating state of the power switching device shown in drawing 3.
[Drawing 5]It is a section explanatory view showing the operating state of the power switching device shown in drawing 3.
[Drawing 6]the power switching device concerning this embodiment of the invention 3 is shown -- it is a sectional view in part.
[Drawing 7]the power switching device concerning this embodiment of the invention 4 is shown -- it is a sectional view in part.
[Drawing 8]the power switching device concerning this embodiment of the invention 5 is shown -- it is a sectional view in part.
[Drawing 9]the power switching device concerning this embodiment of the invention 6 is shown -- it is a sectional view in part.
[Drawing 10]the power switching device concerning this embodiment of the invention 7 is shown -- it is a sectional view in part.

[Drawing 11]It is a sectional view showing an example of the power switching device in the former.
[Drawing 12]the arc extinction of arc process in the power switching device shown in drawing 11 is shown -- it is a sectional view in part.
[Explanations of letters or numerals]
100 A power switching device and 1 A mount and 2 Housing, 3 exiting coils, Four fixed iron cores and 5 A moving core, 6 tripping springs, and 7 Crossbar and 8 Window, 9 A movable contact, 10 contacting springs, and 11 A hole and 12 A wall and 13 Traveling contact, 14 A stationary contact and 15 [An actuator and 20 / An operating curved surface and 21 / A flat-surface part and 22 / A crevice, 23 metallic grids, and 24 / A cam and 25 / A shank, 26 twist springs, and 27 / Arc box.] Fixed contact and 16 A tag block, 17 terminal screws, and 18 An arc runner and 19

[Kind of official gazette]Printing of amendment by regulation of Patent Law Article 17 of 2
[Section Type] The 1st Type of the part VII gate
[Publication date]Heisei 14(2002) January 11 (2002.1.11)

[Publication No.]JP,11-329134,A
[Date of Publication]Heisei 11(1999) November 30 (1999.11.30)
[Annual volume number] Publication of patent applications 11-3292
[Application number]Japanese Patent Application No. 10-138825
[The 7th edition of International Patent Classification]
H01H 9/30

9/46
15/02
33/04
33/22
50/38
73/18
[FI]
H01H 9/30
9/46
15/02
33/04
33/22
50/38
73/18 A

[Written Amendment]
[Filing date]Heisei 13(2001) July 3 (2001.7.3)
[Amendment 1]
[Document to be Amended]Description
[Item(s) to be Amended]0004
[Method of Amendment]Change
[Proposed Amendment]
[0004]Below, operation of this power switching device 800 is explained. If voltage is impressed to the exiting coil 3, magnetic flux will occur. For this reason, a suction force arises between the

fixed iron core 4 and the moving core 5. If this suction force trips and energization force with the spring 6 is exceeded, the moving core 5 and the crossbar 7 will move caudad. Since the moving core 5 is attached to the crossbar 7, the traveling contact 13 and the stationary contact 14 contact by movement of the crossbar 7. Since the interval of the moving core 5 and the fixed iron core 4 is larger than the interval of the traveling contact 13 and the stationary contact 14, the crossbar 7 moves further caudad, after the traveling contact 13 and the stationary contact 14 have contacted. For this reason, contact wipe is obtained and the contacting spring 10 compresses. The energization force to the movable contact 9 by this contacting spring 10 turns into contact pressure of the traveling contact 13 and the stationary contact 14. Closing movement is completed above.

[Amendment 2]

[Document to be Amended]Description

[Item(s) to be Amended]0006

[Method of Amendment]Change

[Proposed Amendment]

[0006]Opening of the traveling contact 13 and the stationary contact 14 will generate the arc A between the both contacts 13 and 14. The arc A moves in the direction which swells in response to the power to the outside according to the repulsive force committed between the arcs A generated in an opposite hand, and the electromagnetic force committed between the current which flows into fixed contact 15. For this reason, the arc spot by the side of the stationary contact 14 is commutated to the arc runner 18, and the arc A moves outside further. And it enters into the metallic grids 801 and is elongated, and the arc A is divided by two or more metallic grids 801, and the extinction of arc of it is carried out by cooling within the metallic grids 801 concerned.

[Amendment 3]

[Document to be Amended]Description

[Item(s) to be Amended]0030

[Method of Amendment]Change

[Proposed Amendment]

[0030]The power switching device by the next invention consists of the resistance element and rectifier which said circuit interrupter connected to two or more commutation electrodes and the commutation inter-electrode concerned in the above-mentioned power switching device.

[Amendment 4]

[Document to be Amended]Description

[Item(s) to be Amended]0042

[Method of Amendment]Change

[Proposed Amendment]

[0042]If the voltage impressed to the exiting coil 3 is removed next, the moving core 5 will trip and it will move up by operation of the spring 6. Since the actuator 19 is connected with the moving core 6 via the crossbar 7, the actuator 19 goes up with the moving core 6. Since the 1st crevice 201 has a certain amount of stroke, in early stages of opening with the traveling contact 13 and the stationary contact 14, the metallic grids 23 are in the position which is separated from contact interspace spare time (refer to drawing 3). Then, the end 24a of the cam 24 is made the flat-surface part 202 of the operating curved surface 20 with a rise of the actuator 19. The metallic grids 23 rock by this and contact interspace spare time is approached (refer to drawing 4).

[Amendment 5]

[Document to be Amended]Description

[Item(s) to be Amended]0052

[Method of Amendment]Change

[Proposed Amendment]

[0052]embodiment 6. drawing 9 shows the power switching device concerning this embodiment

of the invention 6 -- it is a sectional view in part. the power switching device 600 concerning this Embodiment 6 is substantially the same as the power switching device 200 concerning Embodiment 2 -- although like, circuit interrupter portions differ. Hereafter, this different point is explained and explanation is omitted about other composition. The top commutation electrode 301 and the lower commutation electrode 302 are formed in the cam. Besides between the part commutation electrode 301 and the lower commutation electrode 302, the resistance element 401 and the rectifier 501 are connected in series. The resistance element 401 and the rectifier 501 are laid under the cam 24 inside. The commutation electrodes 301 and 302 consist of a conductive and magnetic material.

[Amendment 6]

[Document to be Amended]Description

[Item(s) to be Amended]0053

[Method of Amendment]Change

[Proposed Amendment]

[0053]Below, operation of this power switching device 600 is explained. If the traveling contact 13 and the stationary contact 14 open based on an operation of an exiting coil, an arc will occur between the points of contact 13 and 14. This arc is commutated to the commutation electrodes 301 and 302 located near the contact interspace spare time. Since it is connected to the resistance element 401 and the rectifier 501, the commutation electrodes 301 and 302 flow through an arc current into the resistance element 401 and the rectifier 501. A ** style effect is acquired by this resistance element 401, and the reverse current inhibition effect is acquired with the rectifier 501. Since the commutation electrodes 301 and 302 keep away from an inter-electrode void after the traveling contact 13 and the stationary contact 14 open, it is hard to produce reignition. As mentioned above, an arc carries out an extinction of arc effectively according to the synergistic effect of carrying out a ** style by the resistance element 401, preventing the reverse current by the rectifier 501, and keeping away the commutation electrodes 301 and 302 and extending an arc quickly. As a result, the cutoff performance of an arc improves in a large current region.

[Amendment 7]

[Document to be Amended]Description

[Item(s) to be Amended]0062

[Method of Amendment]Change

[Proposed Amendment]

[0062]In the power switching device concerning the next invention, after a conductive material constitutes a circuit interrupter, an arc can be promptly commutated to a circuit interrupter and the arc extinguishing performance of equipment can be improved.